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West Nile virus

(What happened in 2004??)

in Alberta

The story of West Nile virus in North America is a very recent one. The virus arrived in New York in 1999 and established populations in migratory birds on the Atlantic Flyway. It then systematically increased its population and spread to birds on the other primary migration pathways, moving steadily westward to the Mississippi, Central, and by 2004, the Pacific Flyway. The virus infects birds of many species without causing visible illness, but causes fatal infections in Corvidae (crows, jays, and their relatives). It can occasionally spill over and infect horses and humans, and can cause rare fatal results.

West Nile virus arrived in Alberta first in 2003. By the end of that summer, there was evidence of infected birds, mosquitoes, horses, and humans throughout the grassland region of southern Alberta and the parkland region of central Alberta[1]. The provincial surveillance program identified the virus in 203 crows, 231 magpies, and 5 blue jays as well as 31 pools of mosquitoes, 170 horses, and 275 people. The infections were scattered from the southern fringe of the boreal forest to the Canada/U.S. border, and from the eastern edge of the foothills to the Alberta/Saskatchewan border. *Culex tarsalis* was confirmed as the mosquito species primarily transmitting the virus from infected birds. The virus established a widespread population, with active transmission that began in mid-June, peaked in mid-August, and ended in mid-September.

The situation was very different in 2004[1]. As of October 1, the only positive mosquito pool and the first of four positive horses were found in early August. The first positive bird was found in mid-August and the number of positives remains very low (n=9). There is no evidence yet of transmission to humans in Alberta in 2004.

Why is this year so different from last year? Although we have no definitive answer at this time, some things are readily apparent. The transmission of any virus is driven by a complex interaction of biological and non-biological factors. In the case of West Nile virus, this involves birds, mosquitoes, and weather. However the species, distribution, migration, immune response, and previous exposure to the virus all affect its success in birds.

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For more information on wildlife diseases in Alberta: http://www3.gov.ab.ca/srd/fw/diseases

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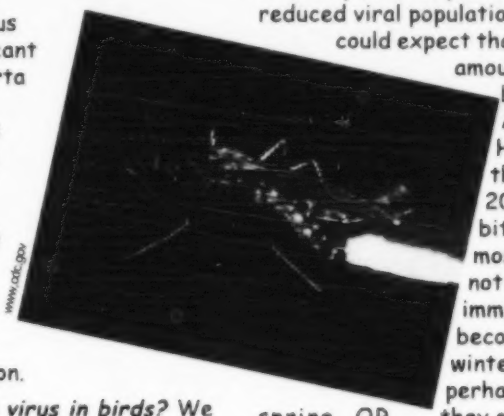
Similarly, the species, distribution, and life stage (only adults transmit the virus) affect the success of the virus in mosquitoes. Infected birds and mosquitoes must overlap in time and space in sufficient numbers to establish and maintain a population of the virus.

It seems clear that the virus did not establish a significant summer population in Alberta in 2004. Two possible explanations come to mind: either migratory birds did not bring a significant amount of virus into Alberta, or when the birds (and the virus) arrived, there were not enough *Culex* mosquitoes available to establish or maintain the virus population.



Why would there be less virus in birds? We know that birds throughout the grassland and parkland regions in 2003 were exposed to a large population of West Nile virus. This may have triggered widespread immunity that could prevent further infection in those individuals. Thus, when the migratory birds returned in the spring, few if any of them may have carried the virus. Similarly, birds that reside in central and southern Alberta year-round also may have been immunized in 2003.

Why did we see infections late in the summer in 2004? After nesting is complete and before they migrate south, many birds move to staging/moulting lakes where they gather in late summer. Banding results show that birds in Montana and Saskatchewan, for example, move into Alberta during August. It is likely that such movements brought the virus into Alberta and made it available to the late August and September population of *Culex tarsalis*.

Will it be the same next year? This is only the second year of West Nile virus in Alberta and we saw completely different patterns of infection and transmission in 2003 and 2004. Thus, we do not have enough information to predict what will happen in 2005. If the bird immunity was the primary reason for the reduced viral population in 2004, then we could expect that there may be limited amounts of virus carried by birds migrating back to Alberta next spring. However, young birds that hatched here in 2004 were probably not bitten by an infected mosquito and thus would not have developed any immunity. These birds could become infected in the wintering areas and could perhaps carry the virus next spring OR they could be immunized to West Nile virus in the wintering areas. On the other hand, if the weather and its effects on the development of *Culex* mosquitoes was the primary reason why we saw less virus in 2004, then a warm spring and long summer could again provide enough mosquitoes at the right time of the year to establish a summer population of West Nile virus in 2005.

West Nile virus has become part of the natural ecosystems of Alberta and it will likely pose some level of concern for human health each summer. The general precautions of avoiding mosquitoes, wearing long sleeves and pants, and using DEET-based insect repellents remain the only sure ways to reduce the risk of human infections.

i Summary report 2003: http://www.health.gov.ab.ca/public/WNv/pdf/WNv_surveillance_summary2003.pdf

ii Evidence in 2004: http://www.health.gov.ab.ca/public/WNv/evidence_temp2004.html

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